

# Klystron Amplifier Utilizing Scandate Cathode and Electrostatic Focusing, Phase I

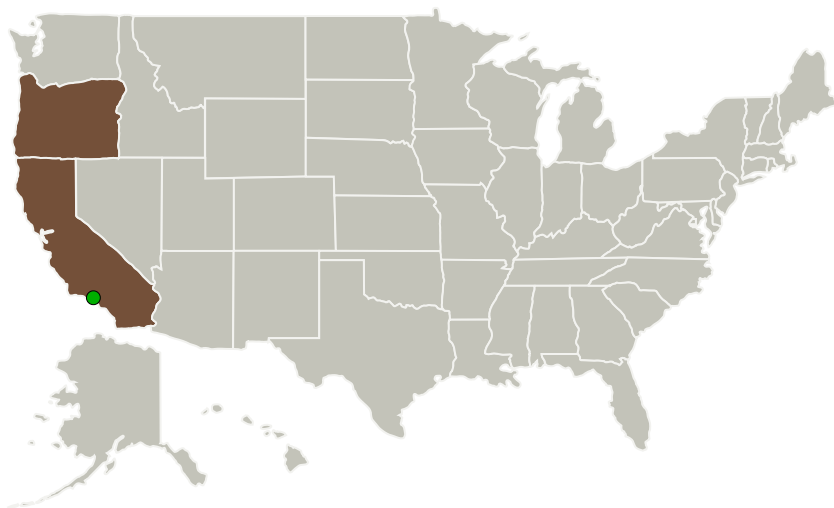
Completed Technology Project (2013 - 2013)



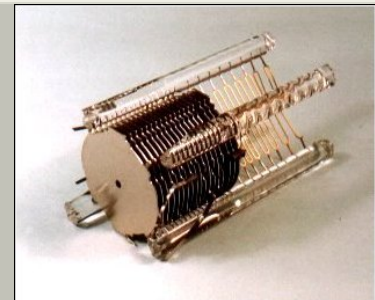
## Project Introduction

We propose to build an electrostatically focused klystron that exploits recent breakthroughs in scandate cathode technology. We have built cathodes with greater than 100 Amps/cm<sup>2</sup> emission. This project offers an opportunity to test those cathodes in real world devices. Because of their small size (.050 inch diameter) and low power dissipation (under 1.2 watts), they are ideal for long-range space missions. Also, their low beam convergence makes electrostatic focusing feasible. This, in turn, provides a dramatic reduction in amplifier size and mass. Without magnets, traveling wave tubes and klystrons will be lighter and smaller, a further enhancement for space missions. Phase I develops cathodes, pierce guns and focusing stacks. Phase II will see construction of a working klystron or TWT. Scandate cathodes also provide longer life than conventional cathodes. Their small size allows amplifiers to reach much higher frequencies, bandwidth, and data rates than current art.

## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
e-beam, Inc.	Lead Organization	Industry Veteran-Owned Small Business (VOSB)	Beaverton, Oregon
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California



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## Primary U.S. Work Locations

California

Oregon

## Project Transitions



**May 2013:** Project Start

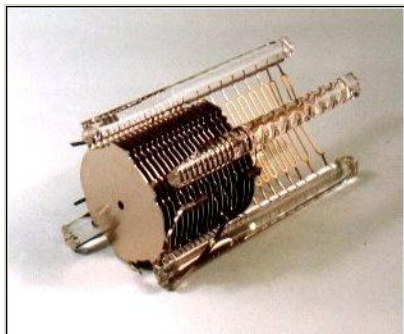


**November 2013:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138241>)

## Images



### Project Image

Klystron Amplifier Utilizing  
Scandate Cathode and Electrostatic  
Focusing  
(<https://techport.nasa.gov/image/131739>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

e-beam, Inc.

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

### Principal Investigator:

Bernard K Vancil

### Co-Investigator:

Bernard Vancil

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## Technology Maturity (TRL)

Start: **2**  
Current: **4**  
Estimated End: **4**



## Technology Areas

### Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - └ TX05.2 Radio Frequency
    - └ TX05.2.2 Power-Efficiency

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System